



Armed Forces College of Medicine

AFCM





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Diseases of kidney

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Lecture (4)

Renal calculi & renal tumours



INTENDED LEARNING OBJECTIVES (ILOs)



By the end of this lecture the student will be able to:

1. Mention the sites , etiology and types of renal calculi.
2. Predict the complications of renal calculi.
3. Mention the origin of renal cell carcinoma and its methods of spread.
4. Correlate the clinical picture with the histopathological features and other laboratory investigations in renal cell carcinoma.
5. State the origin of Wilms' tumour and its methods of spread.
6. Correlate the clinical picture with the histopathological features and other lab investigations in cases of Wilms' tumour



Renal calculi (stones or urolithiasis)

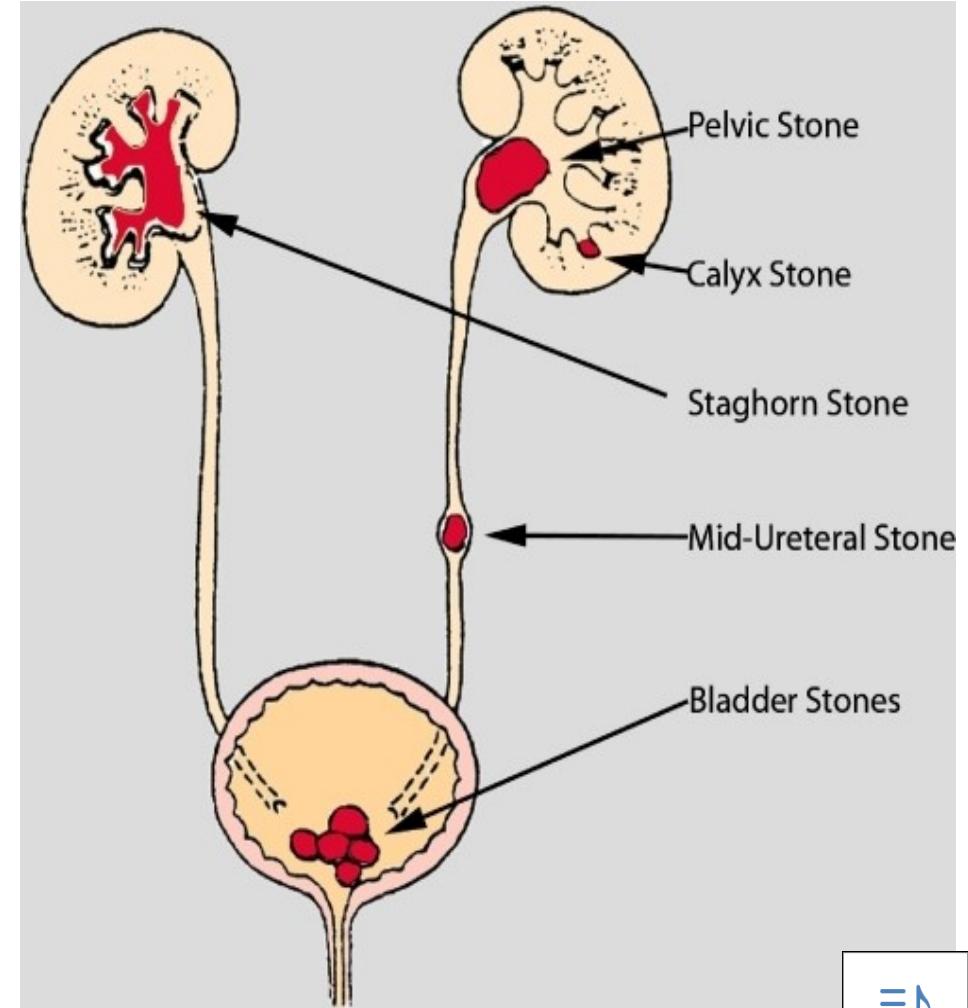


Renal calculi

Due to precipitation of urinary crystalloids in

- Renal pelvis
- Urinary bladder

or





Renal calculi (stones or urolithiasis)

Aetiology

1-Disturbances of Urine composition

2-Stasis of urine

3-Urinary infection





Renal calculi (stones or urolithiasis)

Aetiology

1-Disturbances of urine composition

A. Decreased water content (concentrated urine)

e.g. due to excessive sweating

B. Increased crystalloids

Excess **calcium** as in hyperparathyroidism

Excess **uric acid and urates** in cases of gout

Excess **oxalates**:

1)Hereditary metabolic error

2)Excess intake in diet (mango, tomato)

Familial **cystinuria**





Renal calculi (stones or urolithiasis)

2-Stasis of urine due to urinary obstruction

- Allows easier precipitation of crystalloids of urine
- Predisposes to infection

3-Urinary infection

A. **It predisposes to precipitation of urinary crystalloids**

through formation of a nucleus (nidus) as pus cells, detached necrotic cells.

B. **Change of pH of urine**

Alkaline urine (in case of urea splitting bacteria)

→ favors precipitation of **Phosphate ,ammonium & magnesium**

Increased acidity (in case of E. coli)

9/20/24 Endocrine and genitourinary module





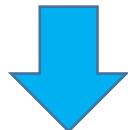
Renal calculi (stones or urolithiasis)

Types of stones

A) Primary (metabolic) stones

B) Secondary (infected) stones

Urinary infection is NOT essential for their formation



Calcium oxalate stones
Uric acid stones
Cystine stones



Magnesium ammonium phosphate stones
(Struvite)



Renal calculi (stones or urolithiasis)

A) Primary (metabolic) stones

Calcium oxalate stones

60%



<https://eunatural.com/kidney-stones-and-oxalates/>

- It forms in **acidic** urine
- Occurs in **renal pelvis**
- Multiple hard with spiny surface
- Dark stones due to injury of urinary mucosa & hemorrhage.

N.B Calcium phosphate stone in alkaline medium

Uric acid stones

8 %



<https://www.stonedisease.org/uric-acidapatite-kidney-stones>

- It forms in **acidic** urine
- Occurs in **renal pelvis**
- Single hard with smooth surface
- Yellowish brown

Cystine stones

2%



<https://www.preventcystinestones.com>

- It forms in **acidic** urine
- Occurs in **renal pelvis**
- Soft
- Yellowish green

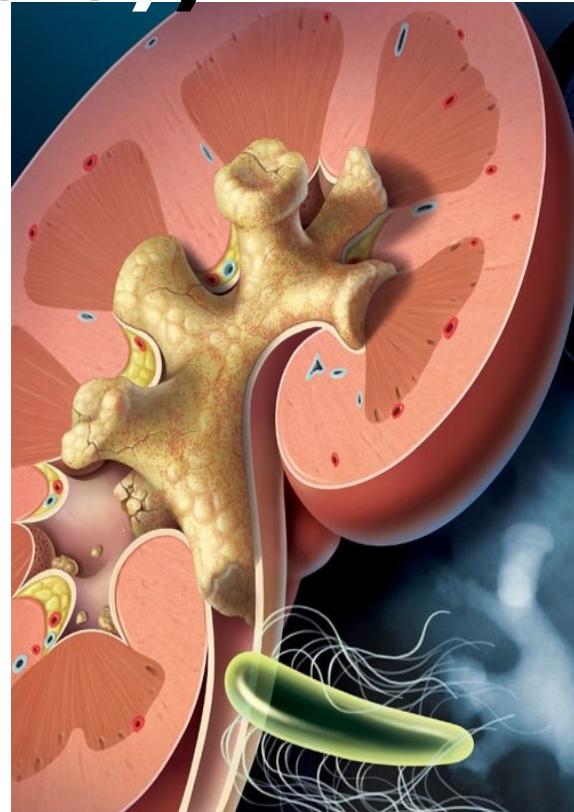


Renal calculi (stones or urolithiasis,)

B) Secondary (infected) stones

Magnesium ammonium phosphate stones (**Struvite stone**) (30%)

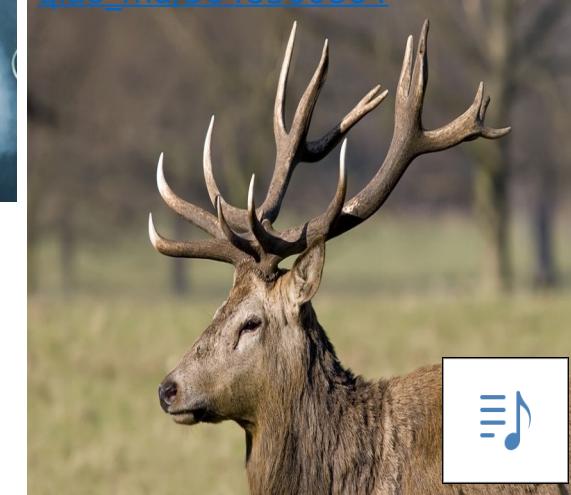
- Develops in **alkaline** urine
- Solitary ,large ,white ,friable, of smooth surface
- **Commonly forms in urinary bladder**
- **May form in renal pelvis & calyces** casting their shape (**Staghorn stone**)



<http://www.toddbuck.com/kidney-stones-5>



https://www.flickr.com/photos/jian-hua_qiao_md/5648360864



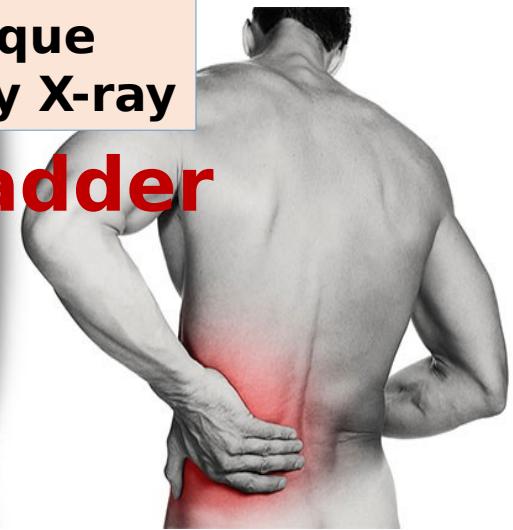
Renal calculi (stones or urolithiasis)

Effects and complications

1- Migration from renal pelvis to ureter or bladder

- Renal colic
- Urinary obstruction

Radio opaque
Shadow by X-ray



2-Urinary obstruction

- Complete & bilateral → Calculus anuria
- Incomplete → Hydroureter & hydronephrosis

<https://colicorenal.top/>

3-Urinary Infection:

due to urinary obstruction and urine stasis

4-Hematuria:

due to trauma to the urinary mucosa particularly by oxalate stone

5-Squamous metaplasia

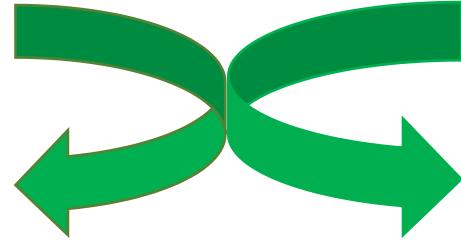
Endocrine and genitourinary module



6-Squamous cell carcinoma

on top of squamous metaplasia

Tumors of kidney



Benign Tumors

- 1-Cortical adenoma
- 2-Oncocytoma
- 3-Angiomyolipoma

Malignant Tumors

- Primary** → **Secondary**
- 1-Renal cell carcinoma
(Hypernephroma)
 - 2-Wilms' tumor
(Nephroblastoma)



Renal cell carcinoma (hypernephroma)



Origin: Epithelial cells lining the renal tubules

Age: Peak incidence 6th decade of life

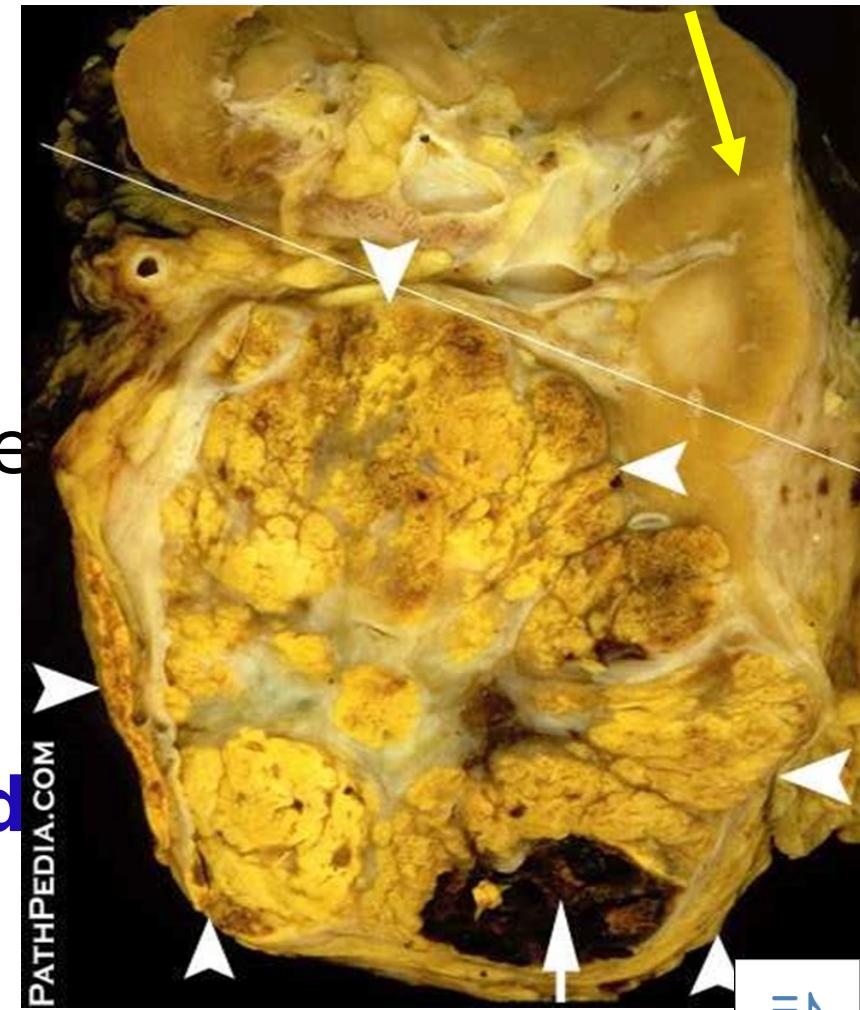
Sex: Male > female (2:1)

Risk Factors: smoking, chronic analgesic use, asbestos exposure, chronic renal failure

Gross

- Arises at one pole of the kidney
- Well defined margins
- Golden yellow** cut surface (**due to lipid & glycogen**)
- Areas of hemorrhage and necrosis
- Rest of kidney is compressed and appears

Compressed renal tissue



PATHPEDIA.COM

<https://www.pathpedia.com/education/earlapathology/kidney/Images.aspx?6>



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Renal cell carcinoma (hypernephroma)

Microscopic variants

1-Clear cell carcinoma

Most common type

2-Papillary renal cell carcinoma

3-Chromophobe renal cell carcinoma



MIC

Renal cell carcinoma, clear cell type

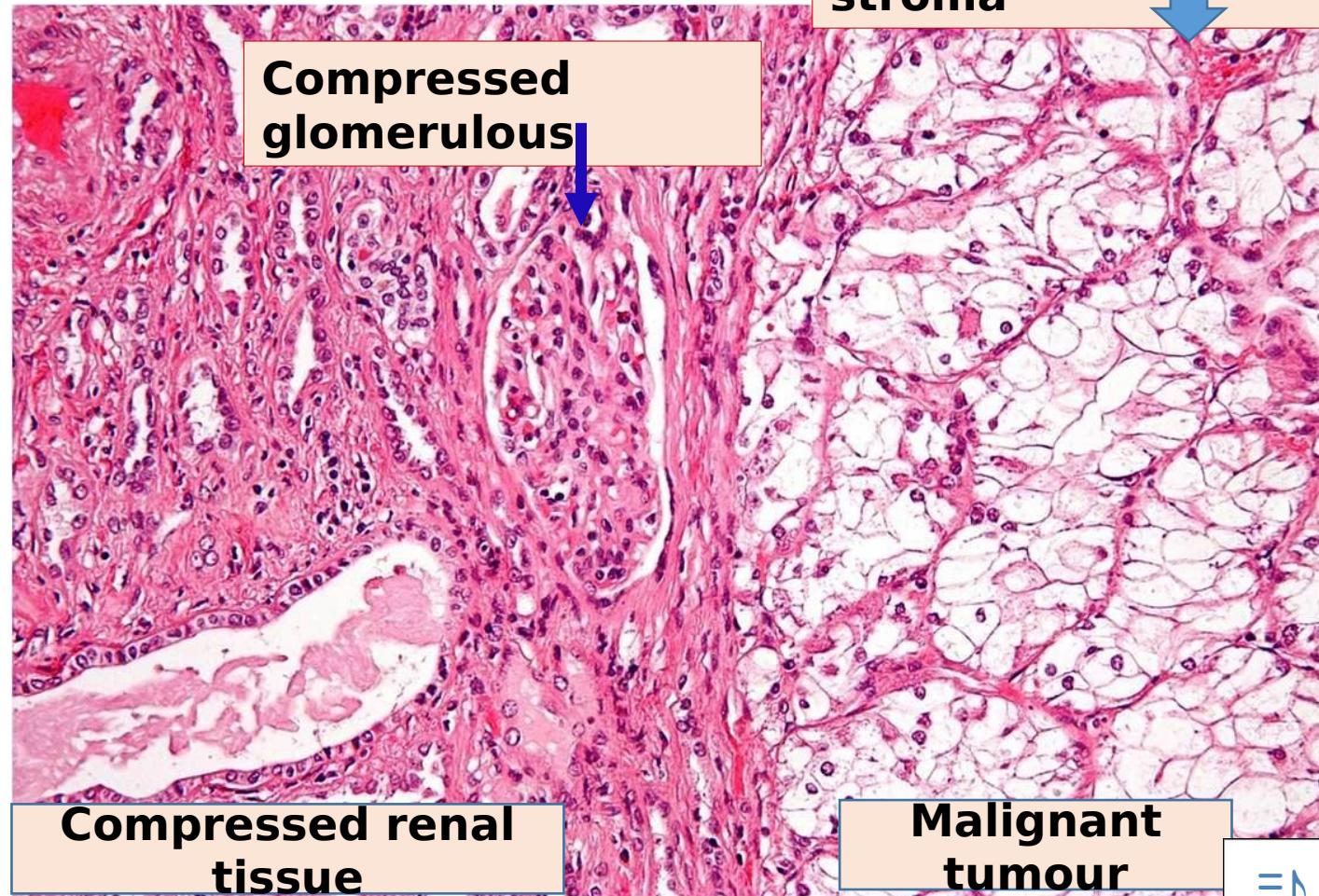


1- Malignant cells are arranged in solid masses , separated by delicate vascular connective tissue stroma.

2-The malignant cells have

- Pale vacuolated cytoplasm
(due to high glycogen & lipids content)**
- Small deeply stained nuclei.**

3- Adjacent renal tissue is compressed.



Renal cell carcinoma

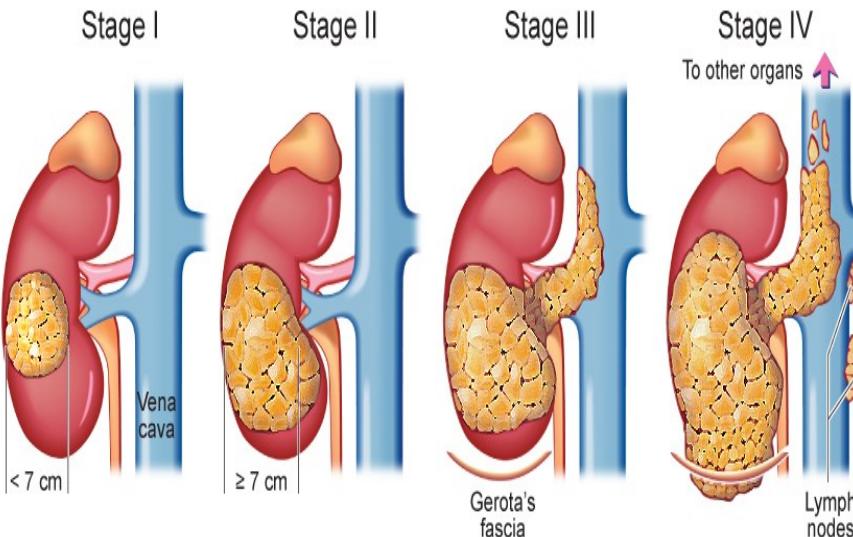


Spread

1-Local infiltration of

kidney tissue with invasion of

- Renal pelvis & ureters
- **Frequently** to renal veins & sometimes extending to IVC
- **Later** to renal capsule & perinephric fat.



2-Blood:

Due to invasion of renal vein.

Most common sites

- Lung (**cannon ball secondaries**)
- bone, brain and adrenal gland

[http://popcultureworldnews.com/
kidney-cancer/stages-of-kidney-cancer](http://popcultureworldnews.com/kidney-cancer/stages-of-kidney-cancer)

**(cannon ball
secondaries)**



3-Lymphatic:

Para-aortic

Endocrine and genitourinary module

9/20/24

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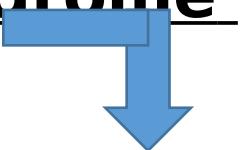


Renal cell carcinoma

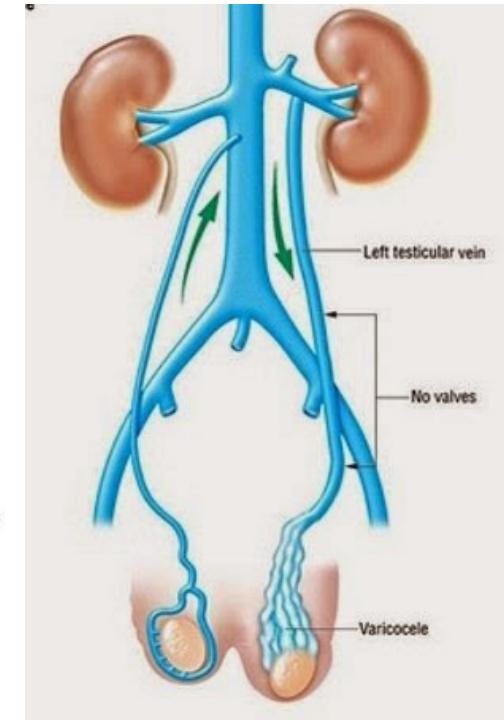
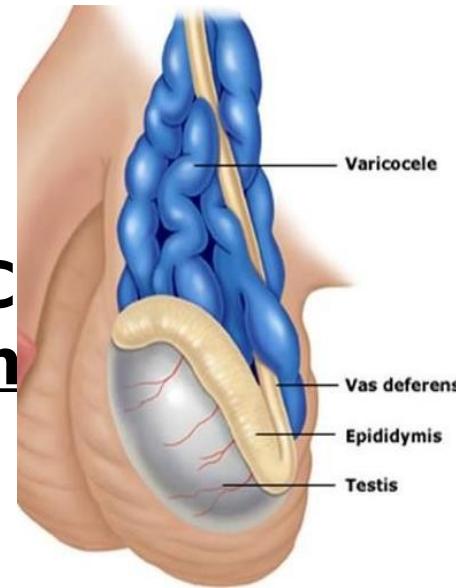


Clinical features

1. Painless hematuria
2. Loin pain
3. Palpable loin mass
4. Varicocele of left testis in case of **left RCC**
5. May remain clinically occult , manifest by m
6. Paraneoplastic syndrome



Varicocele



Polycythemia

Cushing S

Hypertension

Gynaecomastia

Hypercalcemia

Parathormone
like hormone

Due to Erythropoietin

secretion stimulating substance
of (ectopic)



Wilms' tumor (nephroblastoma)



Origin

- Malignant tumour derived from:
mesodermal embryonic cell remnants

Age

- Most common embryonic tumor in infancy & childhood

- Most cases occur in children between **2 - 5** years of age

- Large palpable abdominal mass
- Abdominal pain
- Intestinal obstruction (occasionally)
- Hematuria
- Hypertension



Wilms' tumor (nephroblastoma)

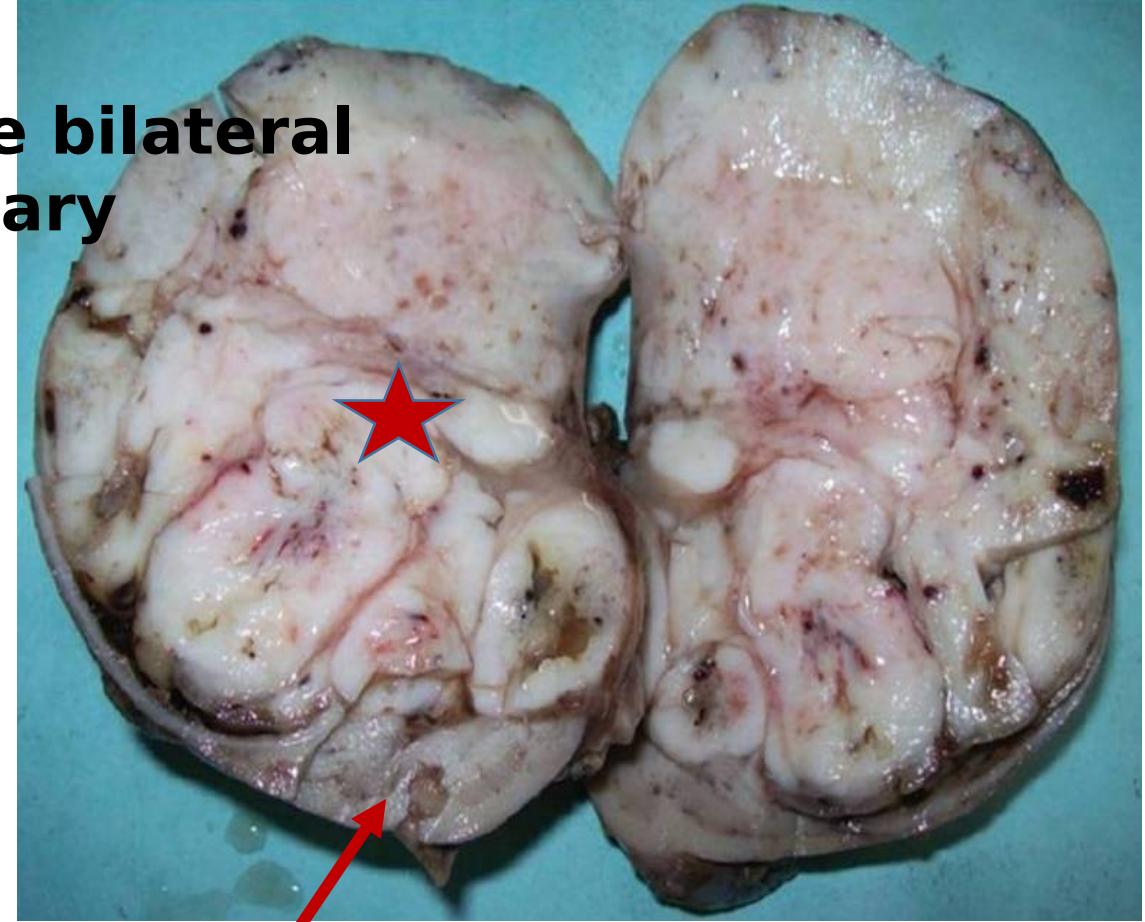


N.B:

- 6% of cases of Wilms' tumor are bilateral**
- One third of tumors are hereditary**

Gross

1. The kidney is enlarged.
2. Cut section showed replacement of renal parenchyma by a **large mass**
 - Well demarcated but non capsulated
 - Lobulated
 - Whitish in colour
 - Foci of hemorrhage & necrosis



Compressed adjacent renal tissue



Wilms' tumor (nephroblastoma)



ic:

Triphasic combination

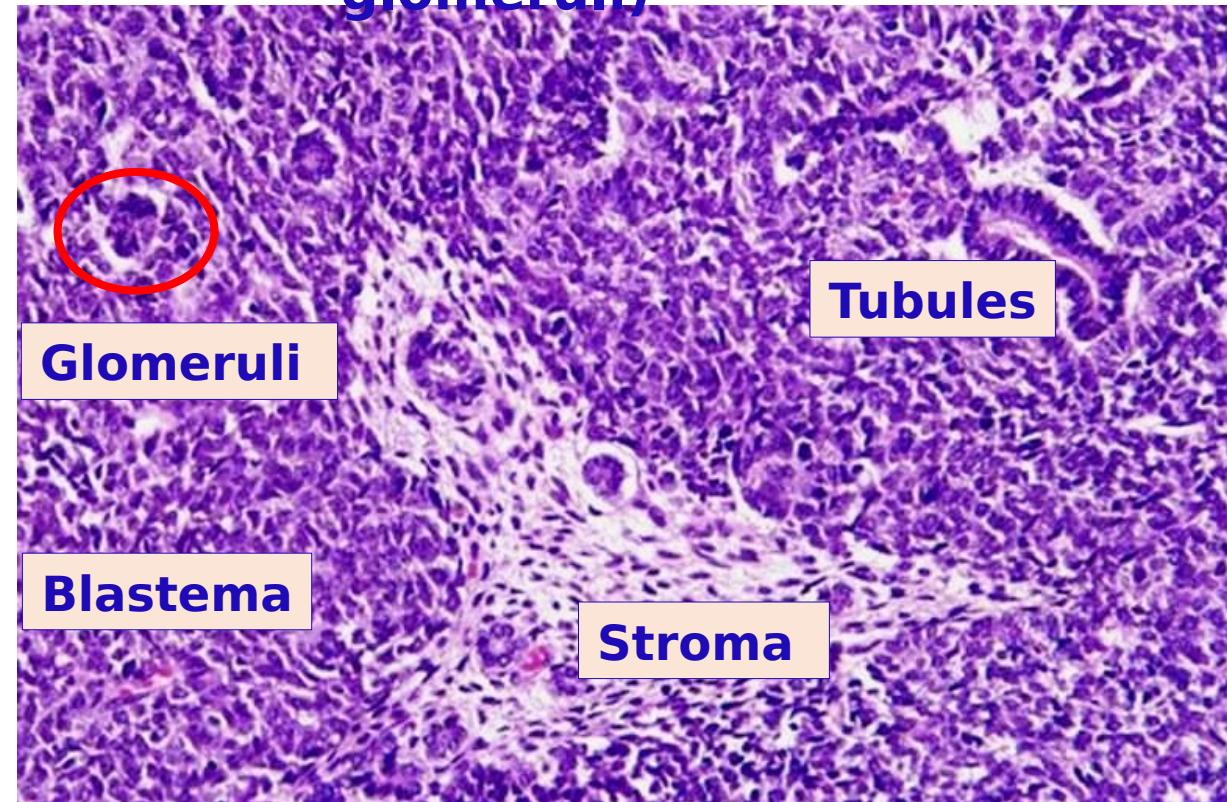
1-Blastemal cells

2-Epithelial cells
(primitive = abortive tubules & glomeruli)

**3-
Mesenchymal elements
(stroma)**

- Sheets of small primitive undifferentiated blue cells

https://www.pedsurglibrary.com/apsa/view/Pediatric-Surgery-NaT/829119/all/Wilms_Tumor



Wilms' tumor (nephroblastoma)



Spread:

1-Local spread: with destruction of kidney tissue

Invasion of

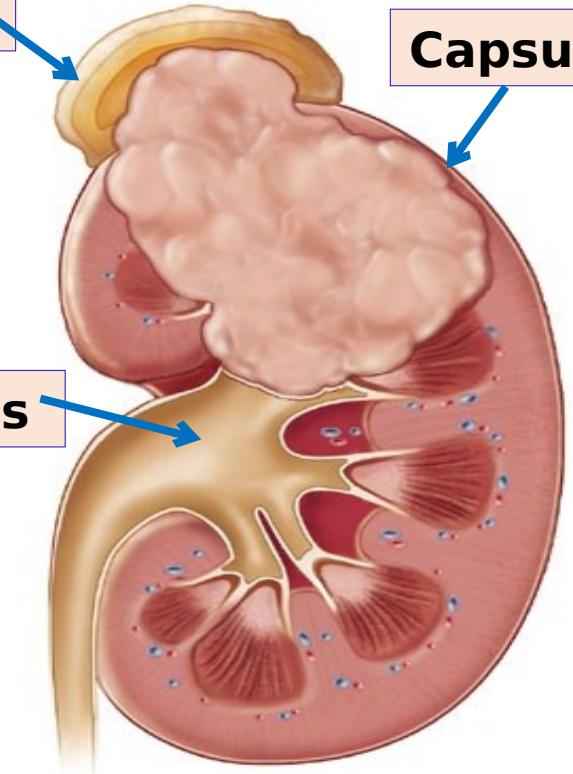
- Renal capsule & perinephric fat
- Adrenal glands, bowel, liver or vertebrae
- Renal pelvis or ureter

2-Blood spread: to Lung ,Liver, Bone, Brain

Suprarenal gland

Capsule

Pelvis



<https://kullabs.com/classes/subjects/units/lessons/notes/note-detail/5024>



Quiz



Which of the following renal tumours most likely causes left-sided varicolele

- A. Oncocytoma
- B. Renal cell carcinoma
- C. Angiomyolipoma
- D. Cortical adenoma

Which of the following renal diseases most likely causes hematuria

- A. Minimal change glomerulonephritis
- B. Renal calculi
- C. Membranous glomerulonephritis
- D. Cortical adenoma



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Quiz



The blastematos tissue in Wilm's tumour consists of which of the following?

- A. Spindle shaped cells
- B. Small primitive cells
- C. Small muscle cells
- D. Malignant epithelial cells
- E. Neuroendocrine cells



Quiz



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SUGGESTED TEXTBOOKS

1. Robbins basic pathology 10th edition, 2018. Chapter 14: Kidney and its collecting system.
2. Kaplan step 1 pathology lecture notes. Chapter 15: Renal pathology ; 2017 (P.143-156)



Thank you

